

## How to Enter Answers in WeBWork

Addition  $+$   $a+b$  gives  $a+b$

Subtraction  $-$   $a-b$  gives  $a-b$

Multiplication  $*$   $a*b$  gives  $ab$

Multiplication may also be indicated by a space or juxtaposition, such as  $2x$ ,  $2x$ ,  $2*x$ , or  $2(x+y)$ .

Division  $/$   $a/b$  gives  $\frac{a}{b}$

Exponents  $^$  or  $**$   $a^b$  gives  $a^b$  as does  $a**b$

Parentheses, brackets, etc  $(...)$ ,  $[...]$ ,  $\{...\}$

### Syntax for entering expressions

- Be careful entering expressions just as you would be careful entering expressions in a calculator.
- Sometimes using the  $*$  symbol to indicate multiplication makes things easier to read. For example  $(1+2)*(3+4)$  and  $(1+2)(3+4)$  are both valid. So are  $3*4$  and  $3\ 4$  (3 space 4, not 34) but using an explicit multiplication symbol makes things clearer.
- Use parentheses  $()$ , brackets  $[]$ , and curly braces  $\{\}$  to make your meaning clear.
- Do not enter  $2/4+5$  (which is  $5\ \frac{1}{2}$ ) when you really want  $2/(4+5)$  (which is  $2/9$ ).
- Do not enter  $2/3*4$  (which is  $8/3$ ) when you really want  $2/(3*4)$  (which is  $2/12$ ).
- Entering big quotients with square brackets, **e.g.**  $[1+2+3+4]/[5+6+7+8]$ , is a good practice.
- Be careful when entering functions. It is always good practice to use parentheses when entering functions. Write  $\sin(t)$  instead of  $\text{sint}$  or  $\sin t$ . WeBWork has been programmed to accept  $\sin t$  or even  $\text{sint}$  to mean  $\sin(t)$ . But  $\sin 2t$  is really  $\sin(2)t$ , i.e.  $(\sin(2))^t$ . Be careful.
- Be careful entering powers of trigonometric, and other, functions. You write  $(\sin(t))^2$  for the square of  $\sin(t)$ , and *never*  $\sin^2 t$ .
- For example for the expression  $2+3\sin^2(4x)$ ,  $2+3\sin^2(4x)$  is wrong. You should enter:  $2+3*(\sin(4*x))^2$ . Why does the last expression work?

### ***Please Excuse My Dear Aunt Sally***

Operations in parentheses are always done first ( $4*x$ ) and then  $(\sin(4*x))$ , next all exponents are taken, giving  $(\sin(4*x))^2$ , next all multiplications and divisions are performed, giving  $3*(\sin(4*x))^2$ . Finally, all additions and subtractions are performed, giving  $2+3*(\sin(4*x))^2$ .

- Remember that multiplication and division have the same precedence and there are no universal rules as to which should be done first in the **absence** of parentheses. WeBWorK and many computers read things from left to right, so  $2/3*4$  means  $(2/3)*4=8/3$ . But some other computers will read  $2/3*4$  as  $2/(3*4)=1/6$ . The same lack of consistent rules concerns powers, expressions like  $2^3^4$ .

The only way to insure that you are entering what you want to enter is the use of parentheses!!!

- Use the Preview Button to see exactly how your entry appears to the system. For example, to tell the difference between  $1+2/3+4$  and  $[1+2]/[3+4]$  click the Preview Button.
- If a problem calls for a decimal answer, give at least four decimal digits, or as many as the problem specifies. For example, write 2.3453 instead of 2.34.

## Intervals in WeBWorK

What is the domain of  $f(x) = \sqrt{x}$ ? One answer is  $x \geq 0$  ( $x$  is greater than or equal to 0). The best way to enter this in WeBWorK is by using interval notation:  $[0, \text{infinity})$ .

Other intervals:

$(2,3]$  is the set  $2 < x \leq 3$ .

$(-\text{infinity},5)$  is the set  $x < 5$ .

$(-\text{infinity}, \text{infinity})$  is the set of all real numbers.

$(2,3] \cup [4,5)$  is the set  $\{2 < x \leq 3 \text{ or } 4 \leq x < 5\}$ . (This is a union of two intervals and can be very important.)

## Mathematical Constants Available In WeBWorK

pi This gives  $\pi \approx 3.14159265358979$ . So  $\cos(\text{pi})$  is  $-1$ .

e This gives  $e \approx 2.718281828459045$ . So,  $\ln(e*2)$  is  $1 + \ln(2)$

## Scientific Notation Available In WeBWorK

2.1E2 gives 210

2.1E-2 gives 0.021

aEb gives  $a \times 10^b$

## Cube roots and $n$ th Roots

$x^{(1/3)}$  gives  $\sqrt[3]{x}$ , the cube root of  $x$

$x^{(1/n)}$  gives  $\sqrt[n]{x}$ , the  $n$ th root of  $x$

$x^{(p/q)}$  gives  $(\sqrt[q]{x})^p$

## Mathematical Functions Available In WeBWorK

- abs( )     $|x|$ , the absolute value
- cos( )    the cosine function. Note: the cosine function uses radian measure
- sin( )    the sine function. Note: the sine function uses radian measure
- tan( )    the tangent function. Note: the tangent function uses radian measure
- sec( )    the secant function. Note: the secant function uses radian measure and  

$$\sec(x) = \frac{1}{\cos(x)}$$
- exp( )    the exponential function,  $e^x$
- log( )    The natural logarithm function. Note that this is NOT the common log function from pre-calculus.
- ln( )    Another, more common name for the natural logarithm,  $\ln(x)$
- logten( ) The common logarithm or log base 10,  $\log_{10}(x)$
- arcsin( ) The inverse sine function.  $\text{asin}()$  is another name for arcsine.
- arccos( ) The inverse cosine function.  $\text{acos}()$  is another name for arccosine.
- arctan( ) The inverse tangent function.  $\text{atan}()$  is another name for arctangent.
- sqrt( )    The square root function
- sgn( )    The sign function — 
$$\text{sgn}(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 & \text{if } x > 0 \end{cases}$$
- step( )    The step function — 
$$\text{step}(x) = \begin{cases} 0 & x < 0 \\ 1 & x \geq 0 \end{cases} \quad (0 \text{ if } x < 0, 1 \text{ if } x \geq 0)$$
- fact( )    The factorial function (defined only for non-negative integers),  

$$\text{fact}(n) = (n)(n-1)(n-2)\cdots(3)(2)(1)$$